

NOAO SOUTH



2009 NSF Large Facilities & AST Safety Workshops

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Astronomy in Chile

- ***Welcome to Chile!***
 - Extremes: from glaciers to the driest desert
 - A modern country with stable government and solid infrastructure
 - Host to some of the finest astronomy facilities in the world

The Beginnings of Tololo, 1960



40 years later...

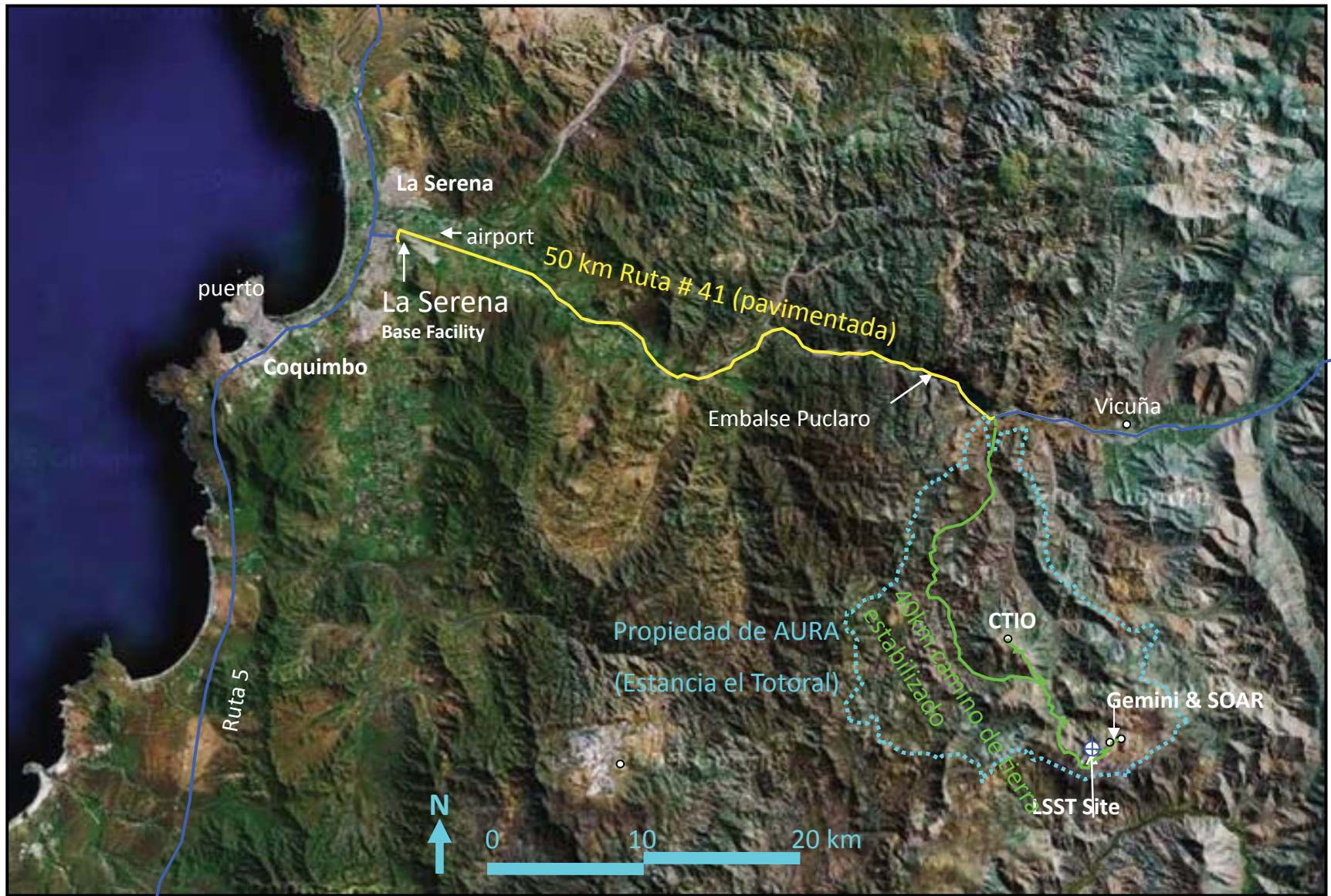
International Observatories in Chile

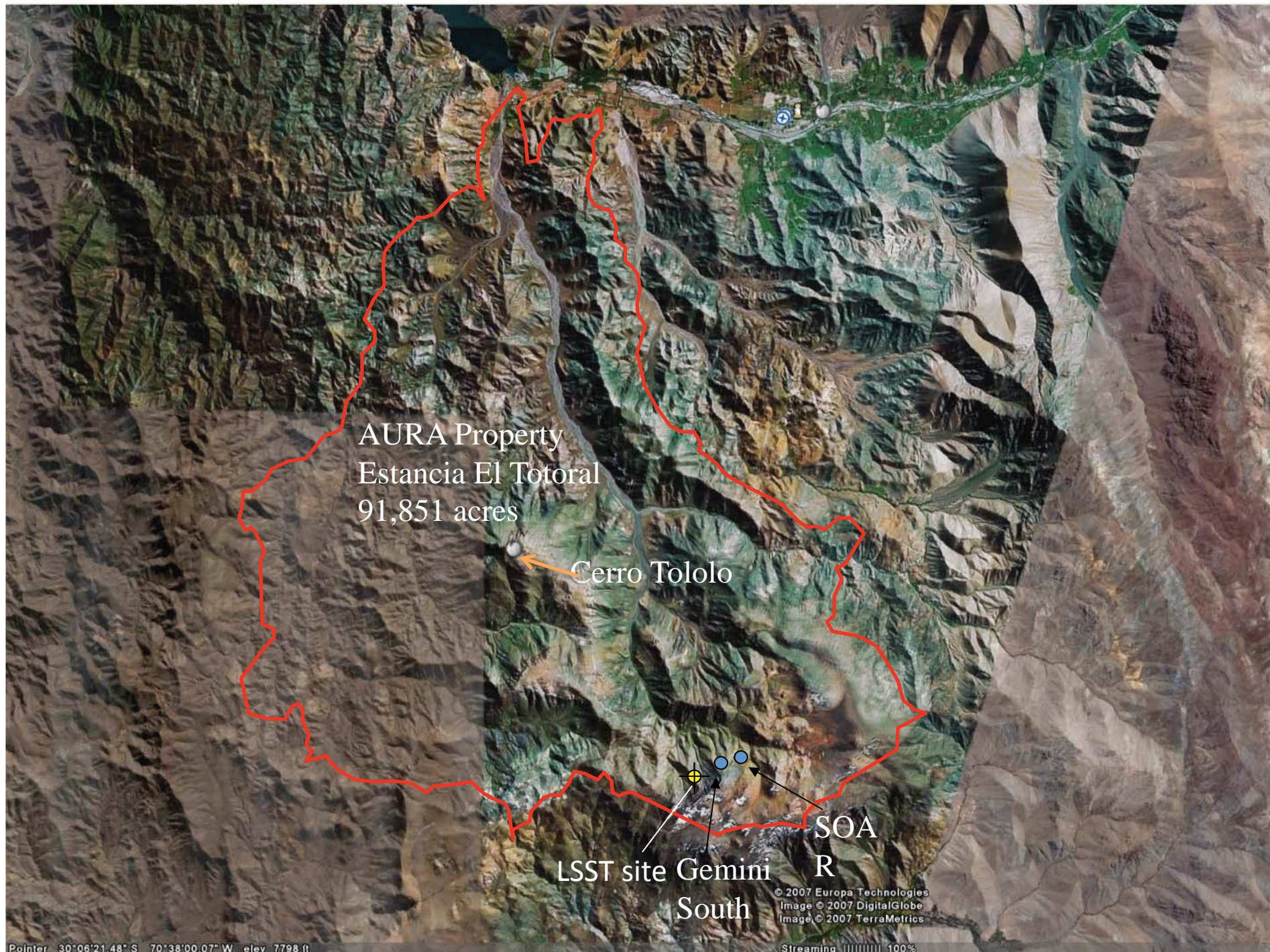


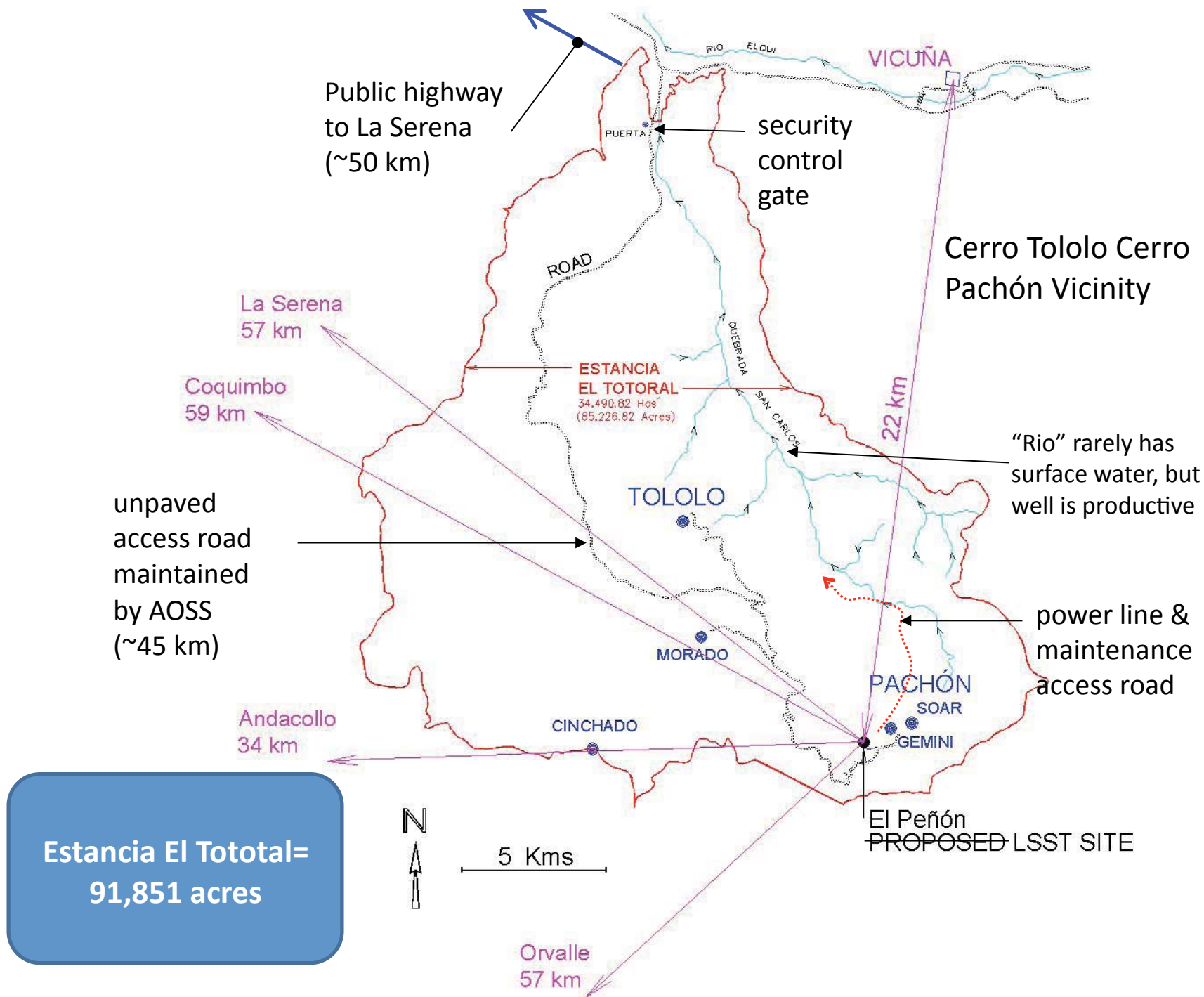
“AURA-O”

- AURA established legal presence in Chile in early 1960s to begin construction of CTIO
- AURA operates in Chile as an “International Organization”
- All activities under AURA umbrella now part of “AURA Observatory in Chile”, or AURA-O
 - Manages all interactions with Chilean govt and other official bodies
 - Manages all contractual activities (only legal entity recognized for AURA-related programs; CTIO & Gemini don’t exist legally)
 - AURA Head of Mission responsible for all AURA activities in Chile

AURA Observatory I







Cerro Tololo Aerial View (Year 2001)



Cerro Tololo

- The property on the Cerro Tololo Inter-American Observatory (named Estancia El Totoral) is located about 500km north of Santiago, Chile, about 70km east of La Serena, at an altitude of 2200 meters.
- The Estancia estate was purchased by AURA in January 1963
- From 1991 through 1999 additional land was acquired to accommodate new telescopes and other basic support infrastructure.

MOUNTAIN OPERATIONS

- 23 Kv Electrical Power Line (29Km – 18 mi)
- Water supply system (4.6 km 2.85 mi long)
 - 3 pump stations,
 - 1,200 mts level difference,
 - 3 ea 200 CuMt water storage tanks
 - Water treatment plant
- Water transport to Pachón
- Visitor Center
- Garbage disposal
- Radio communications with Obs. Facilities
- Safety, environment and security
- Mining activity control

Telescopes

Facility	SQ.FT	SQ.MT
4 Meter Blanco Telescope	40,473.00	3,754.94
1.5 Meter Telescope	7,928.00	736.51
0.91 Meter Telescope	2,351.00	218.41
24" Schmidt Telescope	1,788.00	166.11
24" Lowel Telescope	275.00	25.55
1.3 Meter UMASS Telescope	563.00	52.30
#1 16" Telescope	581.00	53.97
#2 16" Telescope	581.00	53.97
Airglow Telescope	220.45	20.48
Prompt Telescopes (x6)	536.00	49.79
	55,296.45	5,132.03

<i>CERRO TOLOLO FACILITIES</i>	<i>SQFT</i>	<i>SQMT</i>
Round Office Building	3,390.35	314.96
TELOPS Building	2,035.70	189.12
Dining Facility/Kitchen	4,042.00	375.50
Visitor Dormitory	8,259.00	767.26
Worker Dormitory #1	4,859.00	451.40
Worker Dormitory #2	4,150.00	385.54
Recreation Hall	1,524.00	141.58
Laundry	777.00	72.18
ouses (5 @ 1291 SqFt each)	6,455.00	599.67
Warehouse Buildings (Incl. Gate Control)	20,660.00	1,919.50
Garage	3,039.00	282.32
Power House	2,379.20	221.03
Guard House	1,000.00	92.90
Maintenance Shop	5,552.00	515.78
Electronics Facility	3,892.30	361.59
Airglow Telescope	220.45	20.48
Prompt Telescopes (x6)	536.00	49.79
TOTAL	72,771.00	6,760.60




Round Office Building

Dining Dormitory Building



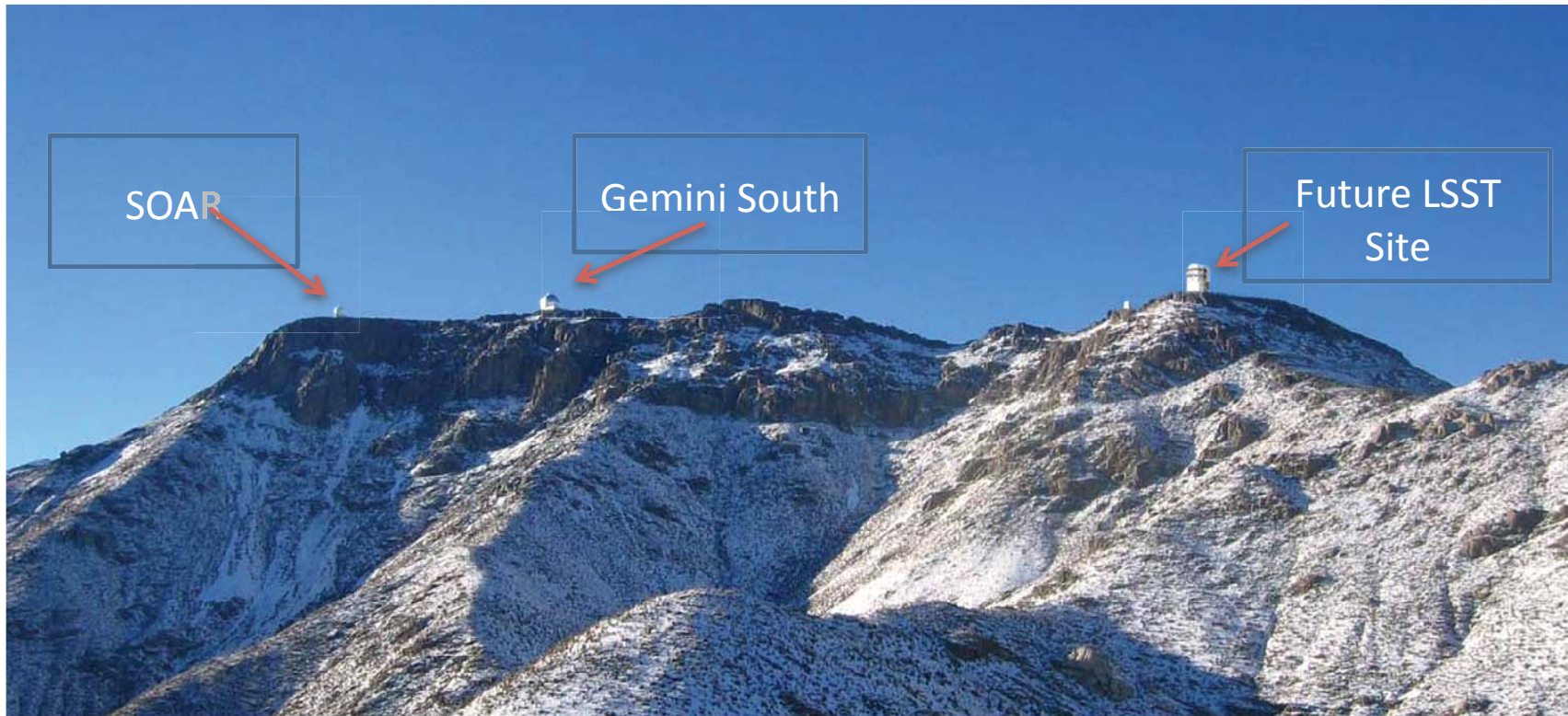
New Developments



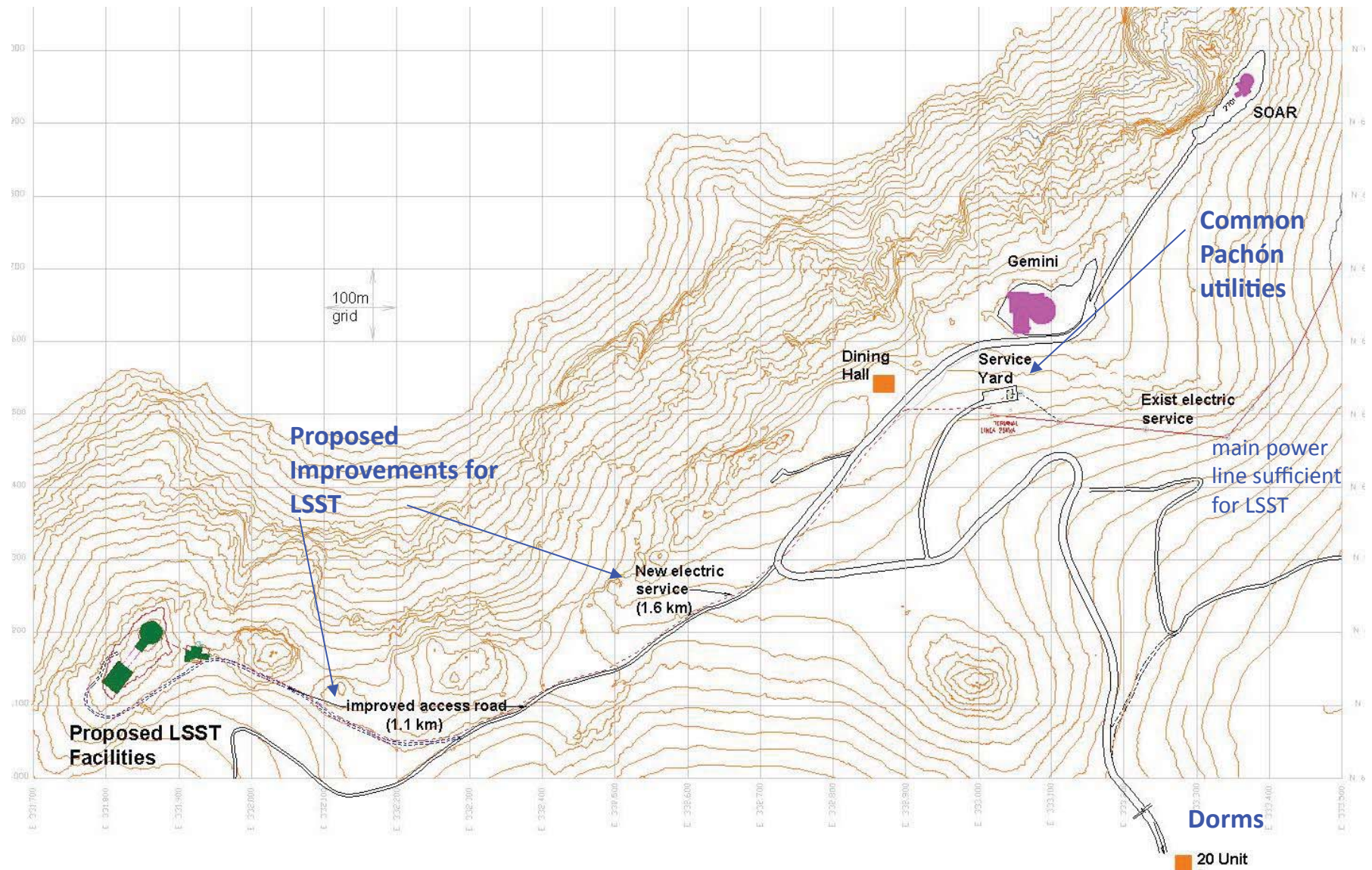
Project	Location
Wisconsin Alpha Mapper (WHAM) 2009	Tololo
Andes Lidar Project – ALO Underway	Pachon
Las Cumbres Global Observatory Network - LCOGT (2010)	Tololo
LSTT (2010)	Pachon

CERRO PACHON

Cerro Pachon is located 10 kilometers southeast of the Cerro Tololo Inter-American Observatory, at 2.715m in the foothills of the Chilean Andes.



Cerro Pachón Site Plan



Cerro Pachon Infrastructure

Cerro Pachon is equipped with basic infrastructure, but it is still under active development

- A paved road to the Telescopes area, and unpaved roads to the lodging and utility areas
- Two dormitory buildings
- A basic kitchen-dining facility (temporary structure)
- 200 CuMt Water Tank
- Further construction includes new dorms, new (permanent) kitchen & support buildings

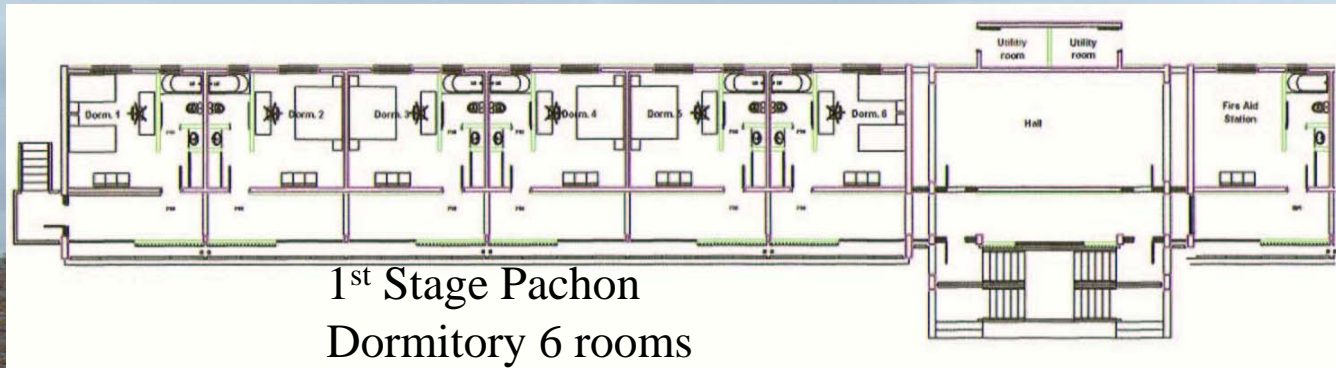
SOAR & Gemini Telescope at Cerro Pachon



SOAR TELESCOPE



Dormitorios de Cerro Pachon



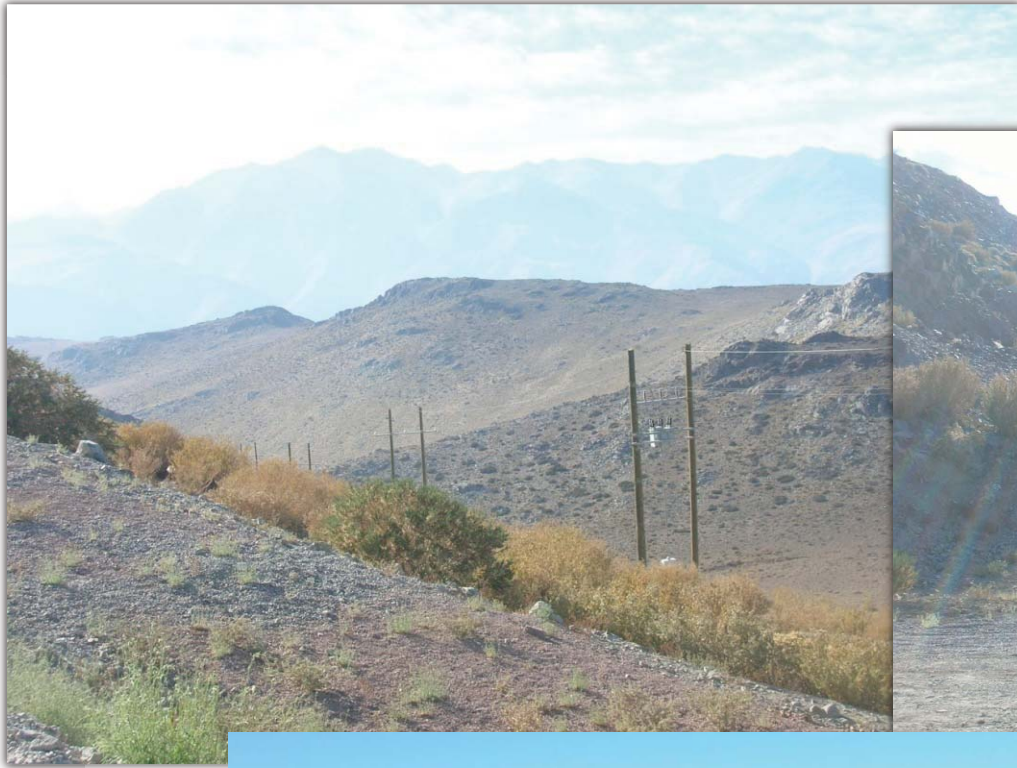
Future C. Pachon Dining & Dormitory Facilities



	<i>CERRO PACHON</i>	<i>SQFT</i>	<i>SQMT</i>
1	Cerro Pachon 20-U Dormitory/Recreation Hall	3,747.00	348.10
2	Cerro Pachon New Dormitory/Recreation Hall	3,712.50	344.90
3	GEMINI Telescope Enclosure & Support Facility	n/a	n/a
4	GEMINI Dining Facility	n/a	n/a
5	SOAR Telescope Enclosure	2,733.00	253.90
6	SOAR Telescope Support Facility	2,195.00	203.92
	TOTAL	12,387.50	1,150.84

Water and Electrical Utilities



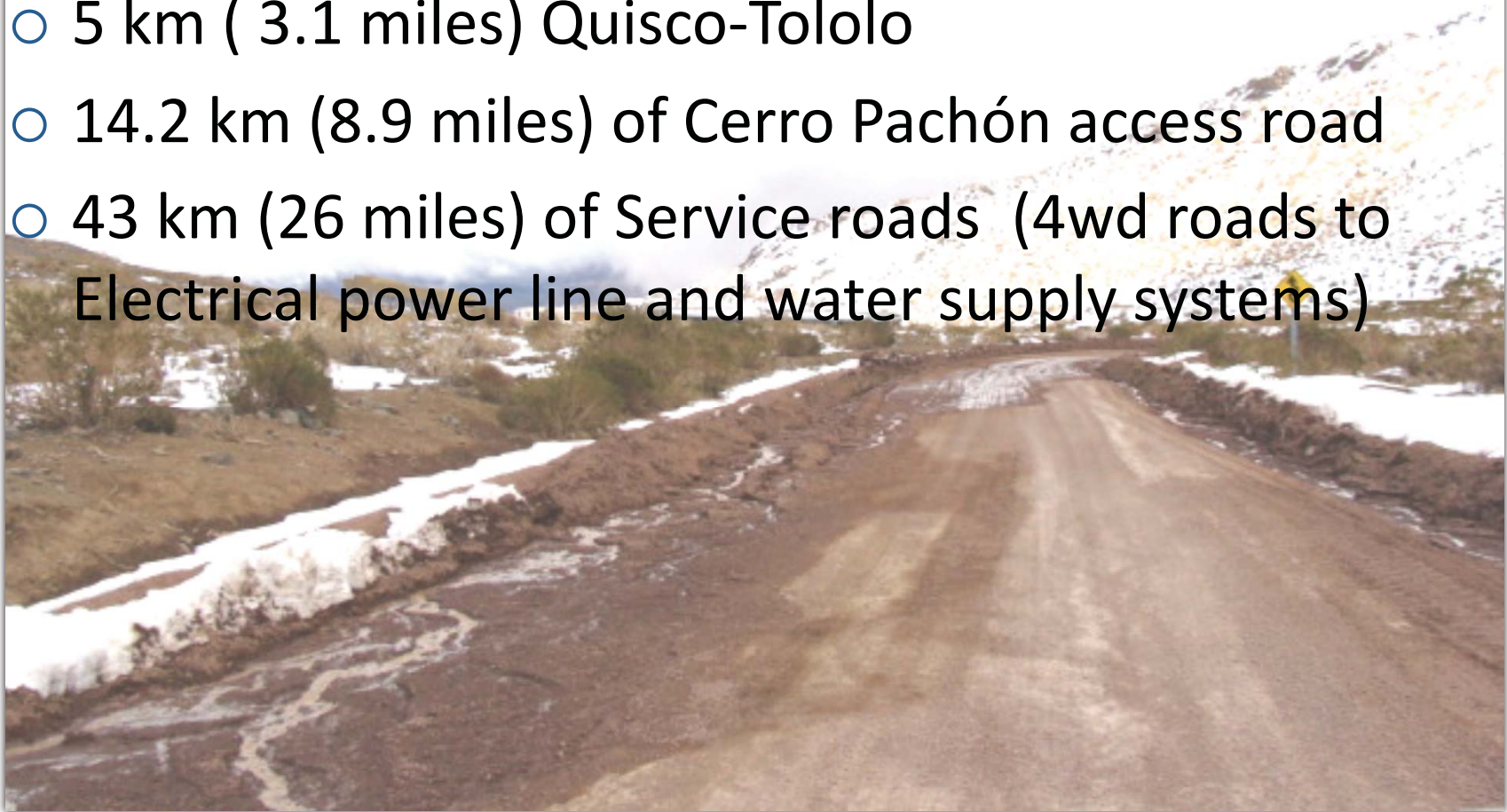


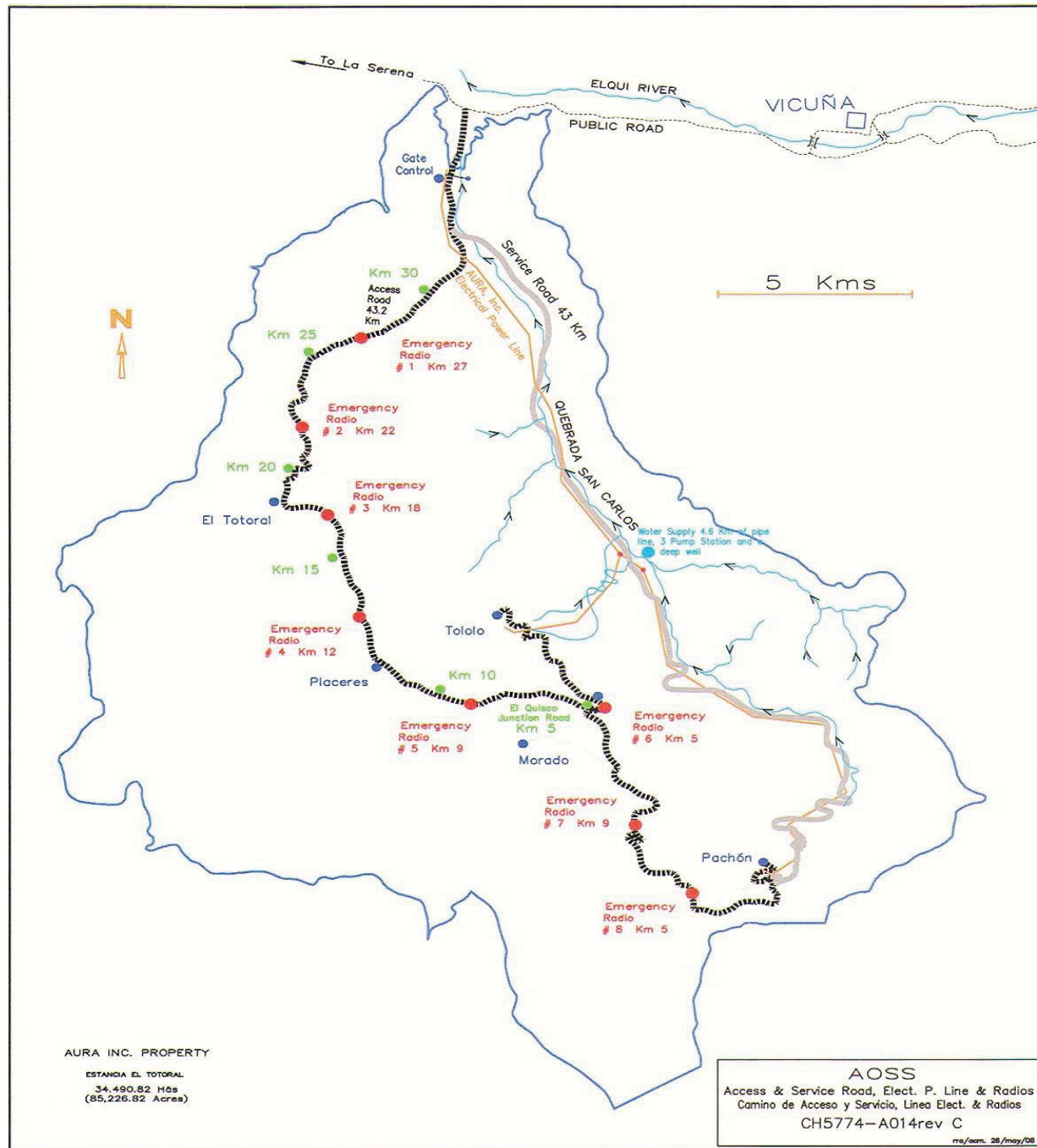
Water Storage
Tanks on Cerro
Tololo



ROADS

- 29 km (18 miles) common access road
- 5 km (3.1 miles) Quisco-Tololo
- 14.2 km (8.9 miles) of Cerro Pachón access road
- 43 km (26 miles) of Service roads (4wd roads to Electrical power line and water supply systems)







Road Maintenance

The Road Maintenance Program consists of the following activities:

- An ongoing regular maintenance plan designed to keep the road driving platform in top condition. It involves grading the entire length of the road at least once every week, coupled with a mid-range full road recuperation and improvement program
- Road emergency clearance and prompt recovery of safe driving conditions during and immediately after foul weather spells



Maintenance Work

- Preventive
 - the grading of the road surface to correct compacting material looseness
- Corrective
 - Hauling large amounts of stabilizing refill material for resurfacing purposes.
 - Reconstructive grading: cutting through, redistributing, and re-compacting the road surface crust, and/or adding new road fill material to obtain proper roadway shape and geometry
 - Road upgrade work, including the correction of the road's geometry, reconstruction of drainage systems and culverts, resurfacing and slope correction, realignment and widening, etc.
- Emergency
 - Return the road to safe driving order after storms, earthquakes and other similar catastrophic natural events.

Road Safety Improvement Plan

- Systematic plan for the installation of guardrail along the most dangerous stretches of the road
- Ultimately aiming at providing guardrail along the full length of the main access road
- Installation of road signs, radio stations, and other safety devices
- Vehicles equipped with GPS devices



Storm damages



Snow Removal Work



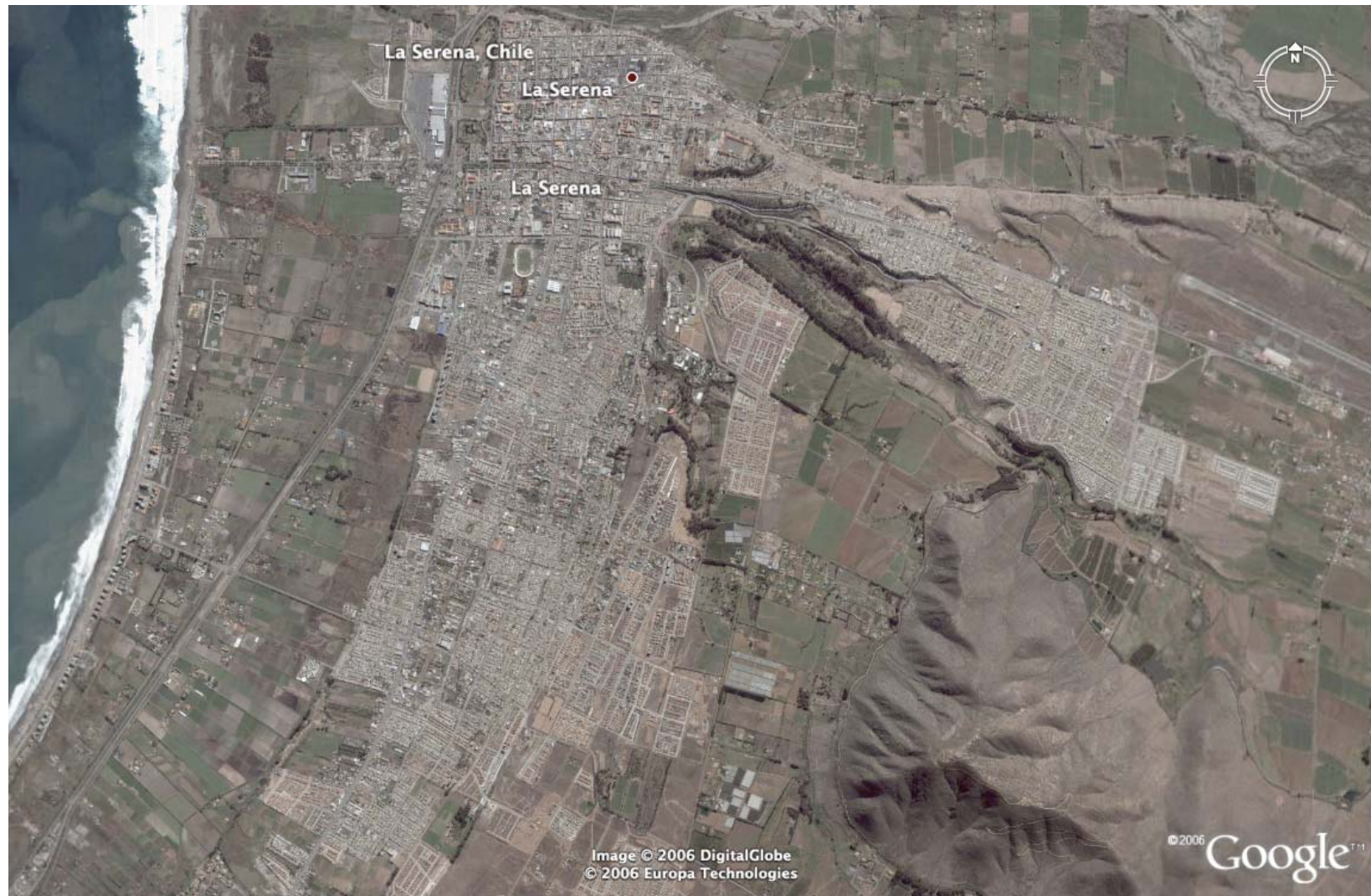
Paving of the Cerro Pachon Summit



Construction of road to El Penon
LSST Site



La Serena



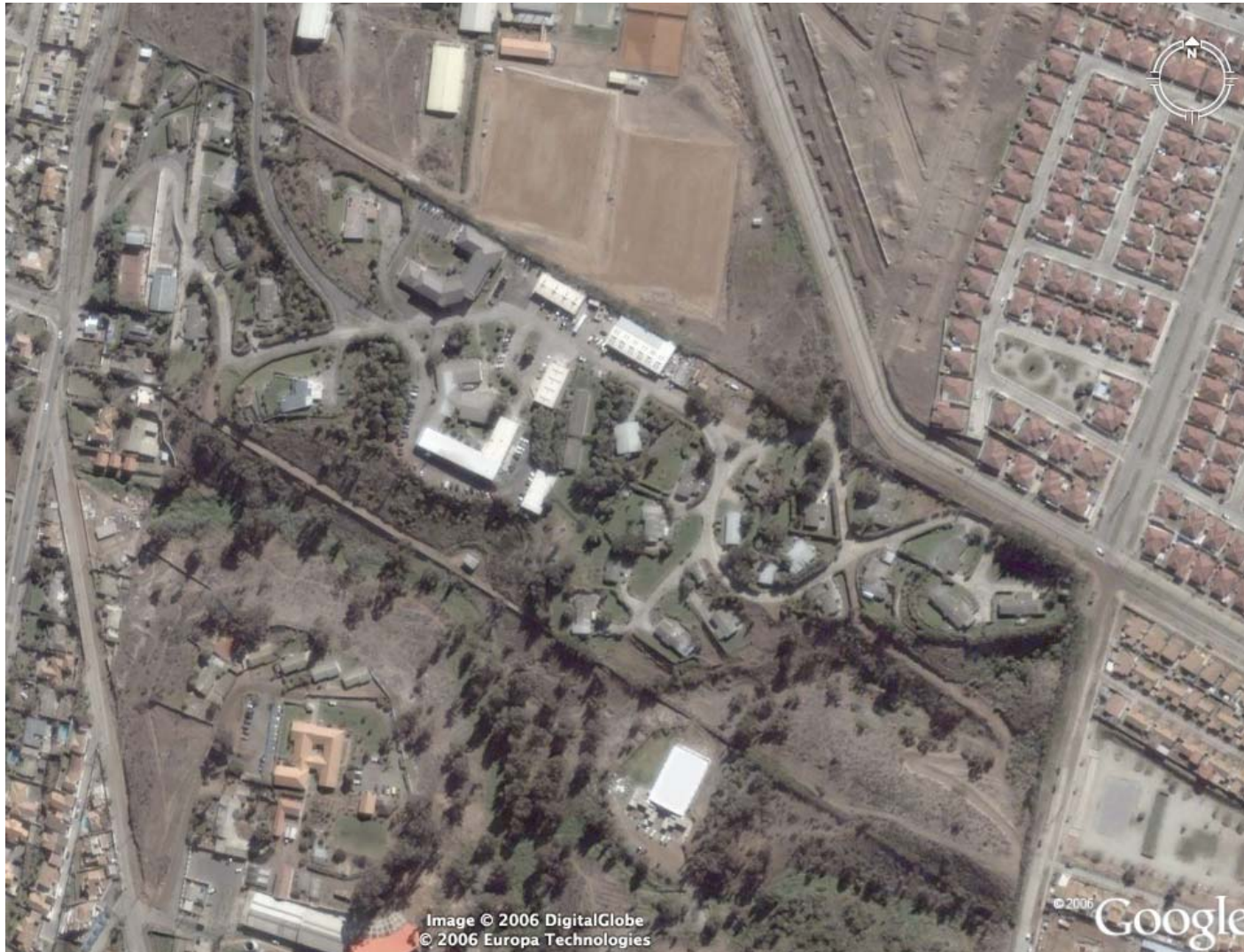
La Serena Property

- The headquarters of the AURA Observatory in Chile are located in the city of La Serena
- The infrastructure at the AURA compound in La Serena is used by sta , resident expatriates and visiting scientists at large:
 - offices, labs, instrument and maintenance shops
 - parks, open areas and recreational facilities

La Serena

- The central portion of the property in La Serena was purchased in October of 1963. This property was destined to the construction of laboratories, employee housing and administration buildings to support the astronomical telescope facilities on Cerro Tololo
- In July of 1966, an additional parcel was acquired to the west for expansion
- In May 1968, an eastern plot was acquired to accommodate for development

AURA Recinto



La Serena Campus Site Plan (32.89 acres)



Gate
Control

Recreational

	<i>LA SERENA FACILITIES</i>	<i>SQFT</i>	<i>SQMT</i>
1	Residential Houses (28-2Apps.)	52,291.50	4,858.04
2	Recreational Facility	3590	N/A
3	Gemini South Facility	N/A	N/A
4	NOAO/CTIO Scientific Building	25,685.10	2,386.15
5	Warehouse	3,200.00	297.28
6	Garage	3,226.00	299.70
7	Instrument/Maintenance Shop	7,336.00	681.51
8	Visitor Dormitory	2,515.00	233.64
9	Laundry	390.00	36.23
10	Telephone Plant	113.3	10.53
11	AOSS Building	4,654.59	432.41
12	Plasma Cutting Machine	574.00	53.32
	TOTAL	103,575.49	9,622.48



Main Office Building La Serena



Administrative Office – La Serena



Gemini South Facility Building



LSST Future Integration

LA SERENA COMPOUND

- HOUSES AND HOSPITALITY
 - 2 Solid masonry houses built during the mid 60's
 - 24 Weston Homes pre-fab houses (built in the early 70's)
 - 2 solid-masonry houses built during the early 80's
 - 2 pre-fab Canadian type houses built during the mid 80's
 - A 12-Unit Motel Building built during the mid 70's



La Serena Compound
Houses





La Serena 12-Dormitory Motel

TOTALS ALL SITES

		<i>SQFT</i>	<i>SQMT</i>
1	LA SERENA	103,575.49	9,622.48
2	CERRO TOLOLO	127,311.00	11,827.58
3	CERRO PACHON	12,387.50	1,150.84
4		1,337.15	124.23
	TOTAL	244,611.14	22,725.12

New Sites Development and Characterization

- AURA has actively pursued the development and characterization of new sites for the advancement of US astronomy in Chile.
- This work involves the construction and maintenance of roads, facilities and utilities to support site research activities.

Tolonchar
(4,800Mt – 15,700Ft)

Tolar



Armazones (TMT Site)

~~The End~~ *Beginning!* I

